WHAT IS CLAIMED IS:

1. A starting device for an internal combustion engine that ignites fuel in an expansion-stroke-cylinder that is a cylinder in an expansion stroke from among a plurality of cylinders of the internal combustion engine to start the internal combustion engine, comprising:

a predicting unit that predicts a state of a crank of the cylinders if the fuel in the expansion-stroke-cylinder is ignited; and

a determining unit that determines whether to start a starter to assist movement of the crank based on the state predicted.

2. The starting device according to claim 1, wherein

the predicting unit predicts a state of the crank before a first ignition is performed in the expansion-stroke-cylinder, and

the determining unit determines whether the starter is to be started before the first ignition is performed in the expansion-stroke-cylinder.

3. The starting device according to claim 1, wherein the predicting unit estimates the state of the crank based on a stop position of the crank and a water temperature in the internal combustion engine.

4. The starting device according to claim 1, wherein the predicting unit estimates combustion power produced if the fuel in the expansion-stroke-cylinder is ignited, and predicts the state of the crank based on the combustion power estimated.

5. The starting device according to claim 4, wherein the predicting unit estimates an amount of oxygen in the expansion-stroke-cylinder and estimates the combustion power based on the amount of oxygen estimated.

6. The starting device according to claim 5, wherein the predicting unit estimates the amount of oxygen based on a stop position of the crank corresponding to air capacity in the expansion-stroke-cylinder.

7. The starting device according to claim 5, wherein the predicting unit estimates air density in the expansion-stroke-cylinder, and estimates the amount of oxygen based on the air density estimated.

8. The starting device according to claim 7, wherein the predicting unit estimates the air density based on a water temperature in the internal combustion engine.

9. The starting device according to claim 4, wherein the predicting unit estimates frictional force produced if the fuel in the expansion-stroke-cylinder is ignited, and predicts the state of the crank based on both the frictional force estimated and the combustion power estimated.

10. The starting device according to claim 9, wherein the predicting unit estimates the frictional force based on friction produced when the crank rotates and a compression work in a follower cylinder that follows the expansion-stroke-cylinder.

11. The starting device according to claim 10, wherein the predicting unit estimates the frictional force based on a stop position of the crank that corresponds to the compression work in the follower cylinder.

12. The starting device according to claim 10, wherein the predicting unit estimates oil viscosity corresponding to the friction, and estimates the frictional force based on the oil viscosity estimated.

13. The starting device according to claim 12, wherein the predicting unit estimates the oil viscosity based on a water temperature in the internal combustion engine.

14. The starting device according to claim 1, wherein the state of the crank is either of a rotational angle of the crank and number of revolutions of the internal combustion engine.

15. The starting device according to claim 1, further comprising a starter controller that controls the starter upon receiving a trigger from the determining unit when the determining unit determines that the starter is to be started, wherein the starter controller provides a control

to start the starter after the fuel in the expansion-stroke-cylinder has been ignited.

16. The starting device according to claim 1, further comprising a starter controller that controls the starter upon receiving a trigger from the determining unit when the determining unit determines that the starter is to be started, wherein the starter controller provides a control to start the starter at a timing such that the starter and the internal combustion engine get coupled to each other when the crank is in a state of acceleration.

17. The starting device according to claim 1, further comprising a starter controller that controls the starter upon receiving a trigger from the determining unit when the determining unit determines that the starter is to be started, wherein the starter controller provides a control to supply a current to the starter so that the current supplied has a minimum magnitude required for a piston in a follower cylinder that follows the expansion-stroke-cylinder to exceed a top dead center of an compression stroke.

18. The starting device according to claim 1, further comprising a starter controller that controls the starter upon receiving a trigger from the determining unit when the determining unit determines that the starter is to be started, wherein the starter controller provides a control to start the starter at such a timing that, when the starter is started and

stopped after certain time but started second time because it is determined that the rotating state of the crank needs to restart the starter, a starting timing of the second time is adjusted such that the starter is coupled to the internal combustion engine during rotation of the crank.

19. A method of starting an internal combustion engine that includes igniting fuel in an expansion-stroke-cylinder that is a cylinder in an expansion stroke from among a plurality of cylinders of the internal combustion engine to start the internal combustion engine, comprising:

predicting a state of a crank of the cylinders if the fuel in the expansion-stroke-cylinder is ignited; and

determining whether to start a starter to assist movement of the crank based on the state predicted.

20. The method according to claim 19, wherein

the predicting is carried out before a first ignition is performed in the expansion-stroke-cylinder, and

the determining is carried out before the first ignition is performed in the expansion-stroke-cylinder.